

What is Claimed Is:

1. A method for fixing a functional material, comprising the steps of:
ejecting a droplet of a functional material dispersed in a solvent onto a
5 fixing surface;
irradiating the droplet ejected onto said fixing surface with a laser
beam; and
locally heating said droplet and gasifying part of the droplet.
- 10 2. A method for fixing a functional material, comprising the steps of:
discretely ejecting a plurality of droplets of a functional material
dispersed in a solvent so that the plurality of droplets are not in contact with each
other onto a fixing surface;
irradiating the droplet ejected onto said fixing surface with a laser
15 beam; and
locally heating said droplet and gasifying part of the droplet.
- 20 3. The method for fixing a functional material, according to claim 2,
further comprising the steps of:
newly ejecting a second droplet onto said fixing surface so that the
second droplet be brought into contact with the first droplet that was partially
gasified;
irradiating said second droplets with a laser beam; and
locally heating said second droplet and gasifying part of the second
25 droplets.

4. A method for fixing a functional material, using a first ink-jet head and a second ink-jet head positioned downstream of said first ink-jet head, said method comprising the steps of:

5 discretely ejecting a plurality of droplets of a functional material dispersed in a solvent onto a fixing surface by using said first ink-jet head so that the first plurality of droplets are not in contact with each other;

irradiating the first droplets ejected onto said fixing surface with a laser beam;

10 locally heating at least two of said first droplets and gasifying part of the droplets;

ejecting a second droplet by using said second ink-jet head so that the second droplet comes into contact with said two droplets that were partially dried;

15 irradiating said second droplet with a laser beam; and
locally heating said second droplet and gasifying part of the second droplet.

5. The method for fixing a functional material, according to claim 1,
20 further comprising the steps of:

irradiating said functional material dried and fixed to said fixing surface with a laser beam; and

locally heating and sintering said functional material.

25 6. A method for fixing a functional material, comprising the steps of:

irradiating a functional material dried and fixed to a fixing surface with

a

laser beam; and

locally heating and sintering said functional material.

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7. The method for fixing a functional material, according to claim 1, wherein said functional material contained in said droplet is dispersed in said solvent in a state in which said functional material is coated with a film.

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8. The method for fixing a functional material, according to claim 1, wherein:

said droplet contains a photothermal conversion material having an absorption band in a wavelength region of said laser beam; and

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part of said solvent principally is gasified by the photothermal conversion effect of said photothermal conversion material.

9. The method for fixing a functional material, according to claim 1, wherein:

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the wavelength region of said laser beam is in an IR region; and part of said solvent principally is gasified by intrinsic absorption of said droplet.

10. The method for fixing a functional material, according to claim 1, wherein:

said droplet is irradiated with a laser beam from the side where said droplet is ejected onto said fixing surface.

11. The method for fixing a functional material, according to claim 1,

5 wherein:

said fixing surface is a surface of a substrate transparent with respect to a wavelength region of the laser beam; and

said droplet is irradiated with the laser beam from the rear surface side of said transparent substrate.

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12. The method for fixing a functional material, according to claim 1,

further comprising the steps of:

ejecting a plurality of droplets substantially simultaneously; and

irradiating a plurality of droplets ejected onto said fixing surface with a

15 plurality of laser beams substantially simultaneously.

13. The method for fixing a functional material, according to claim 12,

further comprising the steps of:

splitting a single laser beam into a plurality of laser beams with a

20 diffraction optical element; and

irradiating said plurality of droplets with the split beams.

14. The method for fixing a functional material, according to claim 12,

further comprising a step of irradiating said plurality of droplets with a plurality of

laser beams by using a semiconductor laser array in which a plurality of semiconductor lasers are arranged into an array.

15. The method for fixing a functional material, according to claim 13 or
5 14, further comprising the steps of:

rotating said diffraction optical element or said semiconductor laser
array around the direction normal to said fixing surface; and

adjusting a beam pitch of said laser beam so as to match the
arrangement pitch of said droplets.

10 16. The method for fixing a functional material, according to claim 1,
further comprising a step of irradiating together a plurality of droplets with a laser
beam shaped such that said plurality of droplets can be laser irradiated at the same
time.

15 17. The method for fixing a functional material, according to claim 1,
wherein:

the intensity distribution of said laser beam has a ring-like, elliptic, or
rod-like shape.

20 18. The method for fixing a functional material, according to claim 17,
wherein:

said laser beam has a beam profile in which the intensity on the outer
edge of the irradiated region is higher than that inside thereof.

19. The method for fixing a functional material, according to claim 5,
wherein:

drying and sintering of said droplets are implemented continuously by
scanning said droplet with a laser beam having an intensity gradient such that the
5 intensity increases gradually from the front edge to the rear edge of the irradiated
region.

20. An apparatus for fixing a functional material, comprising:

droplet ejection means for ejecting a droplet of a functional material
10 dispersed in a solvent onto a fixing surface; and

drying and fixing means for locally heating said droplet ejected onto
said fixing surface and gasifying part of the solvent contained in said droplet by
irradiating the droplet with a laser beam.

15 21. An apparatus for fixing a functional material, comprising:

droplet ejection means for discretely ejecting a plurality of droplets of
a functional material dispersed in a solvent onto a fixing surface so that the plurality
of droplets are not in contact with each other; and

drying and fixing means for locally heating said droplets ejected onto
20 said fixing surface and gasifying part of the solvent contained in said droplets by
irradiating the droplets with a laser beam.

22. The apparatus for fixing a functional material, according to claim 21,
wherein:

said droplet ejection means newly ejects a second droplet so that the second droplet be brought into contact with the first droplet in which part of the solvent was partially gasified by said drying and fixing means; and

5 said drying and fixing means locally heats said second droplet and gasifies part of the solvent contained in said second droplet by irradiating said second droplet with a laser beam.

23. An apparatus for fixing a functional material, comprising:

10 first droplet ejection means for ejecting a first droplet of a functional material dispersed in a solvent onto a fixing surface;

 first drying and fixing means for locally heating said first droplet ejected onto said fixing surface and gasifying part of the solvent contained in the first droplet by irradiating the first droplet with a laser beam;

15 second droplet ejection means positioned downstream of said first droplet ejection means, for ejecting a second droplet of a functional material dispersed in a solvent; and

 second drying and fixing means for locally heating said second droplet ejected onto said fixing surface and gasifying part of the solvent contained in said second droplet by irradiating said second droplet with a laser beam.

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24. The apparatus for fixing a functional material, according to claim 20, comprising:

25 sintering means for locally heating said functional material and sintering said functional material by irradiating said functional material dried and fixed to said fixing surface with a laser beam.

25. An apparatus for fixing a functional material, comprising a sintering means for irradiating a functional material dried and fixed to a fixing surface with a laser beam, thereby locally heating said functional material and sintering said functional material.

26. The apparatus for fixing a functional material, according to claim 20, wherein said functional material contained in said solvent is dispersed in said solvent in a state in which said functional material is coated with a film.

27. The apparatus for fixing a functional material, according to claim 20, wherein:

said droplets contains a photothermal conversion material having an absorption band in a wavelength region of said laser beam; and

said drying and fixing means gasifies part of said solvent principally by a photothermal conversion effect of said photothermal conversion material.

28. The apparatus for fixing a functional material, according to claim 20, wherein:

the wavelength region of said laser beam is an IR region; and
said drying and fixing means gasifies part of said solvent principally by intrinsic absorption of said droplets.

29. The apparatus for fixing a functional material, according to claim 20, wherein:

said drying and fixing means irradiates said droplet with a laser beam from the side where said droplet is ejected onto said fixing surface.

30. The apparatus for fixing a functional material, according to claim 20,

5 wherein:

said fixing surface is a surface of a substrate transparent with respect to a wavelength region of the laser beam; and

said drying and fixing means irradiates said droplet with the laser beam from the rear surface side of said transparent substrate.

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31. The apparatus for fixing a functional material, according to claim 20,

wherein:

said droplet ejection means ejects substantially simultaneously a plurality of droplets; and

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said drying and fixing means irradiates substantially simultaneously a plurality of droplets ejected onto said fixing surface with a plurality of laser beams.

32. The apparatus for fixing a functional material, according to claim 31,

wherein:

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said drying and fixing means comprises a diffraction optical element, splits a single laser beam into a plurality of laser beams by means of said diffraction optical element, and irradiates said plurality of droplets with the split beams.

33. The apparatus for fixing a functional material, according to claim 31,

25 wherein:

said drying and fixing means comprises a semiconductor laser array in which a plurality of semiconductor lasers are arranged into an array and irradiates said plurality of droplets with a plurality of laser beams by using said semiconductor laser array.

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34. The apparatus for fixing a functional material, according to claim 32 or 33, wherein:

said drying and fixing means adjusts a beam pitch of said laser beam so as to match the arrangement pitch of said droplets by rotating said diffraction
10 optical element or said semiconductor laser array around the direction normal to said fixing surface.

35. The apparatus for fixing a functional material, according to claim 20, wherein:

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said drying and fixing means irradiates together a plurality of droplets with a laser beam shaped such that said plurality of droplets can be laser irradiated at the same time.

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36. The apparatus for fixing a functional material, according to claim 20, wherein:

the intensity distribution of said laser beam has a ring-like, elliptic, or rod-like shape.

37. The apparatus for fixing a functional material, according to claim 36,
wherein:

said laser beam has a beam profile in which the intensity on the outer
edge of the irradiated region is higher than that inside thereof.

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38. The apparatus for fixing a functional material, according to claim 24,
wherein:

said drying and fixing means scans said droplets with a laser beam
having an intensity gradient such that the intensity increases gradually from the
10 front edge to the rear edge of the irradiated region, and gasifies part of the solvent
contained in said droplets by laser irradiation in the vicinity of the front edge of said
irradiated region; and

said sintering means sinters said functional material by laser
irradiation in the vicinity of the rear edge of said irradiated region.

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39. The method for fixing a functional material, according to claim 1,
wherein said functional material is any of an electric wiring, a color filter, a
photoresist, a microlens array, an electroluminescent material, or a biological
substance.

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40. A device fabrication method for fabricating a device by using the
method for fixing a functional material, according to claim 1.

41. An electrooptical device comprising a device fabricated by the device
25 fabrication method according to claim 40.

42. An electronic equipment comprising the electrooptical device according to claim 41.